## CLAIMS

[Claim(s)]
[Claim 1]In a high-tension rectifier with which a voltage doubler which comes to carry out constant voltage control when measured value and a preset value of load voltage input an output signal of an inputted voltage regulator into a gating signal generator and control voltage of an ac side was used, A high-tension rectifier which forms current transmission which measures load current, and a voltage correcting operation machine which inputs a current measurement signal measured with this current transmission, and calculates a signal according to a voltage variation value, adds an output signal of this voltage correcting operation machine to an output signal of said voltage regulator, and is characterized by things.
[Claim 2]a voltage variation value shall have relation most important to load current -- relation between an input signal of a voltage operation amendment machine, and an output signal -- the above-mentioned -- the high-tension rectifier according to claim 1 which corresponds to most important relation and is characterized by things.
[Claim 3]The high-tension rectifier according to claim 2 which sets relation between an input signal of a voltage operation amendment machine, and an output signal as a proportionality coefficient corresponding to said proportionality coefficient proportionally with a proportionality coefficient with a voltage variation value constant to load current, and is characterized by things.

## DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]This invention relates to the high-tension rectifier which uses the voltage doubler which generates high voltage direct current voltage, in order to detect the direct-current insulating strength of high-voltage-insulation electric products, such as an insulator.
[0002]
[Description of the Prior Art]Drawing 4 is a circuit diagram of the high-tension rectifier with which the conventional voltage doubler was used. inputting the commercial power 1 into the primary side of the step-up transformer 22 via the power conditioning machine 2, and the high-tension exchange outputted from the downstream being inputted into the voltage doubler 4, being rectified, and a high-pressure direct current being acquired in

this figure, and passing the limiting resistance 61 -- the load 6 -- **** -- last **
[0003]The voltage doubler 4 is that by which the two rectifiers 42 and 43 were connected with the two capacitors 41 and 44 in the circuit as shown in a figure, When the capacitor 41 is charged to the peak value of input voltage via the rectifier 42 when the output voltage of the step-up transformer 22 which is input voltage is positive, the numerals of input voltage are reversed and it becomes negative, This input voltage and the voltage of the capacitor 41 are added, and the capacitor 44 is charged via the rectifier 43. The voltage of this capacitor 44 is impressed to the load 6 via the limiting resistance 61. The limiting resistance 61 is inserted in order to control a short-circuit current when the load 6 connects too hastily, and it can be substantially disregarded at the time of steady operation. Since peak value twice the voltage of input voltage charges, this rectifier 4 is called the voltage doubler to the capacitor 44 as mentioned above.
[0004]Load voltage is inputted into the control device 3 of the power conditioning machine 2 as the signal 102 which was measured with the voltage divider 5 and took the insulation from the main circuit with the isolated amplifier 51. The power conditioning machine 21 is that by which the input voltage of the step-up transformer 22 is controlled by controlling an ignition time by the gate pulse signal with which a control device generates a reverse connection thyristor, It is controlled so that the direct current voltage which the voltage setpoint signal 101 for setting up load voltage and the above-mentioned amplitude-measurement signal 102 are inputted into the control device 3, and is impressed to the load 6 becomes fixed.
[0005]Drawing 5 is a block diagram of the control device 3 of drawing 4. In this figure, it is inputted into the voltage regulator 33 with the voltage setpoint signal 101 via the filter 32 for the amplitude-measurement signal 102 to cut the harmonic content of this signal. The voltage regulator 33 is inputted into the automatic controller with which the PI regulator which is not illustrated after taking a difference signal with these signals 101 and 102 is awarded, and the input signal of the gating signal generator 35 is acquired, The gating signal generator 35 outputs the gate pulse signal 103 for the output signal of the voltage regulator 33 being inputted and controlling a thyristor element.
[0006]
[Problem(s) to be Solved by the Invention]The load 6 has common capacitance load, since it becomes out of control when load voltage exceeds a desired value in that case, it is adjusted to the overdamping which does not have overshooting as a control characteristic of the control device 3, but [ therefore ] it has the fault that speed of response is slow. Since the discharge which became because the capacitors 41 and 44 of the voltage doubler 4 were charged, and passed load when load current decreased rapidly for a certain reason becomes insufficient, there is a problem that it may be in an overvoltage state and may be in the state out of control of moreover stabilizing and continuing in this state.
[0007]The purpose of this invention is in the thing which have a control device which can control the load voltage which has improved the response characteristic of control and was stabilized and for which high-tension rectifier offer is made, without solving such a problem and giving the overshooting characteristic.
[0008]
[Means for Solving the Problem]In a high-tension rectifier with which a voltage doubler which comes to carry out constant voltage control when according to this invention

measured value and a preset value of load voltage input an output signal of an inputted voltage regulator into a gating signal generator and control voltage of an ac side, in order to solve an aforementioned problem was used, Current transmission which measures load current, and a voltage correcting operation machine which inputs a current measurement signal measured with this current transmission, and calculates a signal according to a voltage variation value are formed, An output signal of this voltage correcting operation machine is added to an output signal of said voltage regulator. moreover -- a voltage variation value shall have relation most important to load current -- relation between an input signal of a voltage operation amendment machine, and an output signal -- the above-mentioned -- corresponding to most important relation. Relation between an input signal of a voltage operation amendment machine and an output signal is proportionally set as a proportionality coefficient corresponding to said proportionality coefficient with a proportionality coefficient with a voltage variation value constant to load current. It is considered as a thing.

[0009]

[Function]In the composition of this invention, the voltage variation signal according to a current measurement signal can be acquired by inserting current transmission in the circuit of a load side, measuring load current, providing that measurement signal in a control device, and inputting into the voltage correcting operation machine which calculates and outputs the voltage variation value according to current. By adding this voltage variation signal to the output signal of a voltage regulator, and inputting it into the Gaea signal generator, control which took in advance and carried out the voltage variation can be performed. The easy voltage operation amendment machine of composition can be obtained by giving the nonlinear characteristic corresponding to the most important above-mentioned relation for the relation between the input signal of a voltage operation amendment machine, and an output signal by having the relation most important to load current in a voltage variation value, and disregarding other elements. The voltage operation amendment machine can consist of amplifiers by approximating the most important relation to the proportionality as simplest relation.

[0010]

[Example]This invention is explained based on an example below. Drawing 1 is a circuit diagram of the high-tension rectifier in which the example of this invention is shown, attaches common numerals to the same circuit element as drawing 4, and omits detailed explanation. In this figure, the current measurement signal 103 which measured the load current which flows into the load 6 with the current transmission 7, and insulated this from the main circuit with the isolated amplifier 71 is acquired, and it inputs into the control device 3A.

[0011]Drawing 2 is a block diagram of the control device 3A of drawing 1, attaches the numerals same about the same block as drawing 5, and omits explanation. The current measurement signal 104 is inputted into the voltage correcting operation machine 31A in this figure. As the circuit element which does not attach numerals shows in schematic illustration, the current correcting operation machine 31A is a linear amplifier which consists of combination of an operational amplifier and resistance, and has a function in which an amplification factor can be set as a predetermined value, by adjusting a variable resistor. The current measurement signal 104 is inputted into the adding machine 34 after the multiplication of the predetermined coefficient is carried out with this voltage

correcting operation machine 31A. The output signal of the voltage regulator 33 is also inputted, these are added, and the adding machine 34 becomes an input signal of the gating signal generator 35. The voltage change equivalent to a part for the voltage variation of the voltage doubler by load current is produced, the coefficient, i.e., the amplification factor, by which multiplication is carried out with the voltage correcting operation machine 31A. However, since the voltage variation value to the load current of a actual voltage doubler is not proportional to load current simply and has a nonlinear characteristic in it like the after-mentioned, it is a time of voltage regulations being comparatively small conditions that use of the current correcting operation machine 31A with linear characteristics is allowed.

[0012]As mentioned above, fall rapidly, since the constant voltage control by an amplitude-measurement signal has slow speed of response, cannot follow change of rapid load, especially for the delay in control, load current may become excess voltage and, sometimes, may fall out of control, but. Load current is fed back, and since the good control characteristic of readiness is acquired by compensating a part for the voltage variation to the load current of the voltage doubler 4, the problem of becoming the above excess voltage is avoidable.

[0013]Drawing 3 is a block diagram of the control device which uses the voltage correcting operation machine in consideration of the nonlinearity of the voltage variation characteristic. Differing from drawing 2 in this figure is the point that the voltage correcting operation machine 31B calculates a nonlinear characteristic. In this figure, the correcting operation machine 31B makes an address signal the output signal of A/D converter 311 and A/D converter 311 which change the current measurement signal 104 into a digital signal, Consisting [ and ] of ROM312 which outputs the data memorized to this address, this output data is inputted into the output signal of D/A converter ROM312 by the adding machine 34. Thus, the methods of accessing storage cells, such as ROM and RAM, directly without using CPU are Direct Memory Access and the thing which carries out abbreviated and is called DMA, Although other surrounding circuits, such as a clock generation machine, are required for the actual voltage correcting operation machine 31B, these are omitted here and only the fundamental thing is illustrated. Of course, even if it uses the analog operating circuit which the digital calculation method which uses CPU may be sufficient as, and combined the analog operation machine, the voltage correcting operation machine 31B of the same function can be constituted, and the voltage correcting operation machine 31B shown in drawing 2 is only the example.

[0014]There is a relation of the voltage variation characteristic to the load current of the actual voltage doubler 4 being nonlinear as mentioned above, and being proportional also to the peak value of the output voltage of the converter transformer 22. Therefore, in the voltage correcting operation machine for calculating the voltage variation value to load current strictly, the input of the signal equivalent to the peak value of the output voltage of the converter transformer 22 other than a load current signal is required. However, since it may think that this peak value does not change substantially, it can be said that it is enough practical also by what had a nonlinear characteristic over mere load current like the voltage operation amendment machine 31B by considering that this is constant value. Under the conditions limited also with the current operation amendment machine 31A of drawing 2 made into linear characteristics above most simply, it is fully practical.

[0015]Since there is an advantage [ although / compared with the voltage operation

amendment machine 31B, composition was simpler for the voltage correcting operation machine 31A ] that it is cheaply reliable, What is necessary is just to adopt this voltage correcting operation machine 31A, if the point that a control characteristic is inferior by having approximated the nonlinear characteristic to linear characteristics and having carried out it does not become a problem in practice. Then, when there is a problem in a control characteristic, a voltage correcting operation machine with the nonlinear characteristic of the voltage correcting operation machine 31B etc. will be used.
[0016]
[Effect of the Invention]As mentioned above, in addition to the amplitude measurement by a voltage divider, with current transmission, this invention measures load current and inputs it into a control device. The voltage correcting operation machine which calculates and outputs the voltage variation value according to current to a control device can be formed, the above-mentioned current measurement signal can be inputted into this voltage correcting operation machine, and a voltage variation signal can be acquired as an output signal. By adding this voltage variation signal to the output signal of a voltage regulator, and inputting it into the Gaea signal generator, Since control which took in advance and carried out the voltage variation can be performed, it becomes a control system which has readiness compared with the control system which feeds back only an amplitude-measurement signal, and even when load current fluctuates rapidly, the effect that control which is stabilized and holds load voltage uniformly can be performed is acquired.
[0017]The easy voltage operation amendment machine of composition can be obtained by giving the nonlinear characteristic corresponding to the most important above-mentioned relation for the relation between the input signal of a voltage operation amendment machine, and an output signal by having the relation most important to load current in a voltage variation value, and disregarding other elements. Since a voltage operation amendment machine is realizable with an amplifier by approximating the most important relation to the simplest proportionality, it becomes still cheaper and high-reliability.

## TECHNICAL FIELD

[Industrial Application]This invention relates to the high-tension rectifier which uses the voltage doubler which generates high voltage direct current voltage, in order to detect the direct-current insulating strength of high-voltage-insulation electric products, such as an insulator.

## PRIOR ART

[Description of the Prior Art]Drawing 4 is a circuit diagram of the high-tension rectifier with which the conventional voltage doubler was used. inputting the commercial power 1 into the primary side of the step-up transformer 22 via the power conditioning machine 2, and the high-tension exchange outputted from the downstream being inputted into the voltage doubler 4, being rectified, and a high-pressure direct current being acquired in

this figure, and passing the limiting resistance 61 -- the load 6 -- **** -- last **
[0003]The voltage doubler 4 is that by which the two rectifiers 42 and 43 were connected with the two capacitors 41 and 44 in the circuit as shown in a figure, When the capacitor 41 is charged to the peak value of input voltage via the rectifier 42 when the output voltage of the step-up transformer 22 which is input voltage is positive, the numerals of input voltage are reversed and it becomes negative, This input voltage and the voltage of the capacitor 41 are added, and the capacitor 44 is charged via the rectifier 43. The voltage of this capacitor 44 is impressed to the load 6 via the limiting resistance 61. The limiting resistance 61 is inserted in order to control a short-circuit current when the load 6 connects too hastily, and it can be substantially disregarded at the time of steady operation. Since peak value twice the voltage of input voltage charges, this rectifier 4 is called the voltage doubler to the capacitor 44 as mentioned above.
[0004]Load voltage is inputted into the control device 3 of the power conditioning machine 2 as the signal 102 which was measured with the voltage divider 5 and took the insulation from the main circuit with the isolated amplifier 51. The power conditioning machine 21 is that by which the input voltage of the step-up transformer 22 is controlled by controlling an ignition time by the gate pulse signal with which a control device generates a reverse connection thyristor, It is controlled so that the direct current voltage which the voltage setpoint signal 101 for setting up load voltage and the above-mentioned amplitude-measurement signal 102 are inputted into the control device 3, and is impressed to the load 6 becomes fixed.
[0005]Drawing 5 is a block diagram of the control device 3 of drawing 4. In this figure, it is inputted into the voltage regulator 33 with the voltage setpoint signal 101 via the filter 32 for the amplitude-measurement signal 102 to cut the harmonic content of this signal. The voltage regulator 33 is inputted into the automatic controller with which the PI regulator which is not illustrated after taking a difference signal with these signals 101 and 102 is awarded, and the input signal of the gating signal generator 35 is acquired, The gating signal generator 35 outputs the gate pulse signal 103 for the output signal of the voltage regulator 33 being inputted and controlling a thyristor element.

## EFFECT OF THE INVENTION

[Effect of the Invention]As mentioned above, in addition to the amplitude measurement by a voltage divider, with current transmission, this invention measures load current and inputs it into a control device. The voltage correcting operation machine which calculates and outputs the voltage variation value according to current to a control device can be formed, the above-mentioned current measurement signal can be inputted into this voltage correcting operation machine, and a voltage variation signal can be acquired as an output signal. By adding this voltage variation signal to the output signal of a voltage regulator, and inputting it into the Gaea signal generator, Since control which took in advance and carried out the voltage variation can be performed, it becomes a control system which has readiness compared with the control system which feeds back only an amplitude-measurement signal, and even when load current fluctuates rapidly, the effect that control which is stabilized and holds load voltage uniformly can be performed is acquired.
[0017]The easy voltage operation amendment machine of composition can be obtained

by giving the nonlinear characteristic corresponding to the most important above-mentioned relation for the relation between the input signal of a voltage operation amendment machine, and an output signal by having the relation most important to load current in a voltage variation value, and disregarding other elements. Since a voltage operation amendment machine is realizable with an amplifier by approximating the most important relation to the simplest proportionality, it becomes still cheaper and high-reliability.

## TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]The load 6 has common capacitance load, since it becomes out of control when load voltage exceeds a desired value in that case, it is adjusted to the overdamping which does not have overshooting as a control characteristic of the control device 3, but [ therefore ] it has the fault that speed of response is slow. Since the discharge which became because the capacitors 41 and 44 of the voltage doubler 4 were charged, and passed load when load current decreased rapidly for a certain reason becomes insufficient, there is a problem that it may be in an overvoltage state and may be in the state out of control of moreover stabilizing and continuing in this state.
[0007]The purpose of this invention is in the thing which have a control device which can control the load voltage which has improved the response characteristic of control and was stabilized and for which high-tension rectifier offer is made, without solving such a problem and giving the overshooting characteristic.

## MEANS

[Means for Solving the Problem]In a high-tension rectifier with which a voltage doubler which comes to carry out constant voltage control when according to this invention measured value and a preset value of load voltage input an output signal of an inputted voltage regulator into a gating signal generator and control voltage of an ac side, in order to solve an aforementioned problem was used, Current transmission which measures load current, and a voltage correcting operation machine which inputs a current measurement signal measured with this current transmission, and calculates a signal according to a voltage variation value are formed, An output signal of this voltage correcting operation machine is added to an output signal of said voltage regulator. moreover -- a voltage variation value shall have relation most important to load current -- relation between an input signal of a voltage operation amendment machine, and an output signal -- the above-mentioned -- corresponding to most important relation. Relation between an input signal of a voltage operation amendment machine and an output signal is proportionally set as a proportionality coefficient corresponding to said proportionality coefficient with a proportionality coefficient with a voltage variation value constant to load current. It is considered as a thing.

## OPERATION

[Function]In the composition of this invention, the voltage variation signal according to a current measurement signal can be acquired by inserting current transmission in the circuit of a load side, measuring load current, providing that measurement signal in a control device, and inputting into the voltage correcting operation machine which calculates and outputs the voltage variation value according to current. By adding this voltage variation signal to the output signal of a voltage regulator, and inputting it into the Gaea signal generator, control which took in advance and carried out the voltage variation can be performed. The easy voltage operation amendment machine of composition can be obtained by giving the nonlinear characteristic corresponding to the most important above-mentioned relation for the relation between the input signal of a voltage operation amendment machine, and an output signal by having the relation most important to load current in a voltage variation value, and disregarding other elements. The voltage operation amendment machine can consist of amplifiers by approximating the most important relation to the proportionality as simplest relation.

## EXAMPLE

[Example]This invention is explained based on an example below. Drawing 1 is a circuit diagram of the high-tension rectifier in which the example of this invention is shown, attaches common numerals to the same circuit element as drawing 4, and omits detailed explanation. In this figure, the current measurement signal 103 which measured the load current which flows into the load 6 with the current transmission 7, and insulated this from the main circuit with the isolated amplifier 71 is acquired, and it inputs into the control device 3A.

[0011]Drawing 2 is a block diagram of the control device 3A of drawing 1, attaches the numerals same about the same block as drawing 5, and omits explanation. The current measurement signal 104 is inputted into the voltage correcting operation machine 31A in this figure. As the circuit element which does not attach numerals shows in schematic illustration, the current correcting operation machine 31A is a linear amplifier which consists of combination of an operational amplifier and resistance, and has a function in which an amplification factor can be set as a predetermined value, by adjusting a variable resistor. The current measurement signal 104 is inputted into the adding machine 34 after the multiplication of the predetermined coefficient is carried out with this voltage correcting operation machine 31A. The output signal of the voltage regulator 33 is also inputted, these are added, and the adding machine 34 becomes an input signal of the gating signal generator 35. The voltage change equivalent to a part for the voltage variation of the voltage doubler by load current is produced, the coefficient, i.e., the amplification factor, by which multiplication is carried out with the voltage correcting operation machine 31A. However, since the voltage variation value to the load current of a actual voltage doubler is not proportional to load current simply and has a nonlinear characteristic in it like the after-mentioned, it is a time of voltage regulations being comparatively small conditions that use of the current correcting operation machine 31A with linear characteristics is allowed.

[0012]As mentioned above, fall rapidly, since the constant voltage control by an amplitude-measurement signal has slow speed of response, cannot follow change of rapid load, especially for the delay in control, load current may become excess voltage and,

sometimes, may fall out of control, but. Load current is fed back, and since the good control characteristic of readiness is acquired by compensating a part for the voltage variation to the load current of the voltage doubler 4, the problem of becoming the above excess voltage is avoidable.
[0013]Drawing 3 is a block diagram of the control device which uses the voltage correcting operation machine in consideration of the nonlinearity of the voltage variation characteristic. Differing from drawing 2 in this figure is the point that the voltage correcting operation machine 31B calculates a nonlinear characteristic. In this figure, the correcting operation machine 31B makes an address signal the output signal of A/D converter 311 and A/D converter 311 which change the current measurement signal 104 into a digital signal, Consisting [ and ] of ROM312 which outputs the data memorized to this address, this output data is inputted into the output signal of D/A converter ROM312 by the adding machine 34. Thus, the methods of accessing storage cells, such as ROM and RAM, directly without using CPU are Direct Memory Access and the thing which carries out abbreviated and is called DMA, Although other surrounding circuits, such as a clock generation machine, are required for the actual voltage correcting operation machine 31B, these are omitted here and only the fundamental thing is illustrated. Of course, even if it uses the analog operating circuit which the digital calculation method which uses CPU may be sufficient as, and combined the analog operation machine, the voltage correcting operation machine 31B of the same function can be constituted, and the voltage correcting operation machine 31B shown in drawing 2 is only the example.
[0014]There is a relation of the voltage variation characteristic to the load current of the actual voltage doubler 4 being nonlinear as mentioned above, and being proportional also to the peak value of the output voltage of the converter transformer 22. Therefore, in the voltage correcting operation machine for calculating the voltage variation value to load current strictly, the input of the signal equivalent to the peak value of the output voltage of the converter transformer 22 other than a load current signal is required. However, since it may think that this peak value does not change substantially, it can be said that it is enough practical also by what had a nonlinear characteristic over mere load current like the voltage operation amendment machine 31B by considering that this is constant value. Under the conditions limited also with the current operation amendment machine 31A of drawing 2 made into linear characteristics above most simply, it is fully practical.
[0015]Since there is an advantage [ although / compared with the voltage operation amendment machine 31B, composition was simpler for the voltage correcting operation machine 31A ] that it is cheaply reliable, What is necessary is just to adopt this voltage correcting operation machine 31A, if the point that a control characteristic is inferior by having approximated the nonlinear characteristic to linear characteristics and having carried out it does not become a problem in practice. Then, when there is a problem in a control characteristic, a voltage correcting operation machine with the nonlinear characteristic of the voltage correcting operation machine 31B etc. will be used.

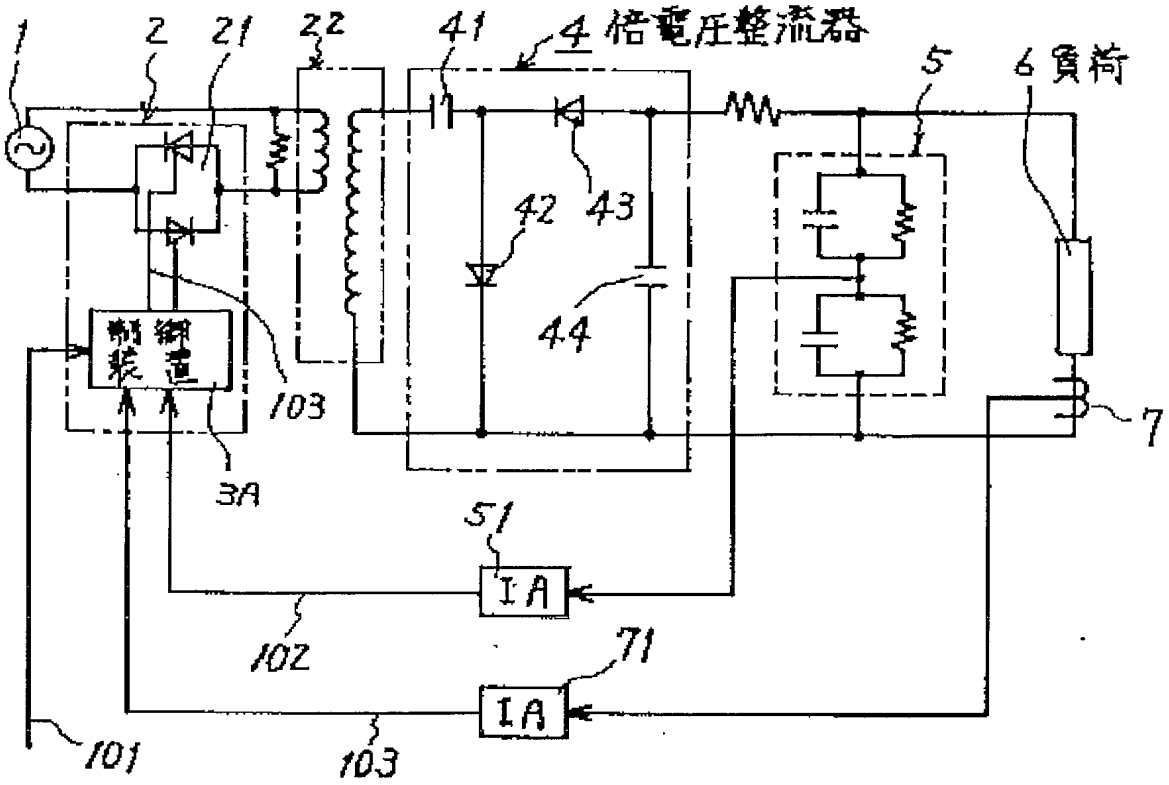
## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The circuit diagram of the high-tension rectifier in which the example of this

invention is shown
[Drawing 2]The block diagram of the control device of drawing 1
[Drawing 3]The block diagram of the control device in which another example of this invention is shown
[Drawing 4]The circuit diagram of the conventional high-tension rectifier
[Drawing 5]The block diagram of the control device of drawing 4
[Description of Notations]
1 AC power supply
2 Power conditioning machine
21 Thyristor converter
3 Control device
3A Control device
3B Control device
31A Voltage correcting operation machine
31B Voltage correcting operation machine
33 Voltage regulator
34 Adding machine
35 Gating signal generator
4 Voltage doubler
6 Load
7 Current transmission

**DRAWINGS**

[Drawing 1]


1
2
21
22
41
4 倍電圧整流器
5
6 負荷
42
43
44
制御装置
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3A
7
51
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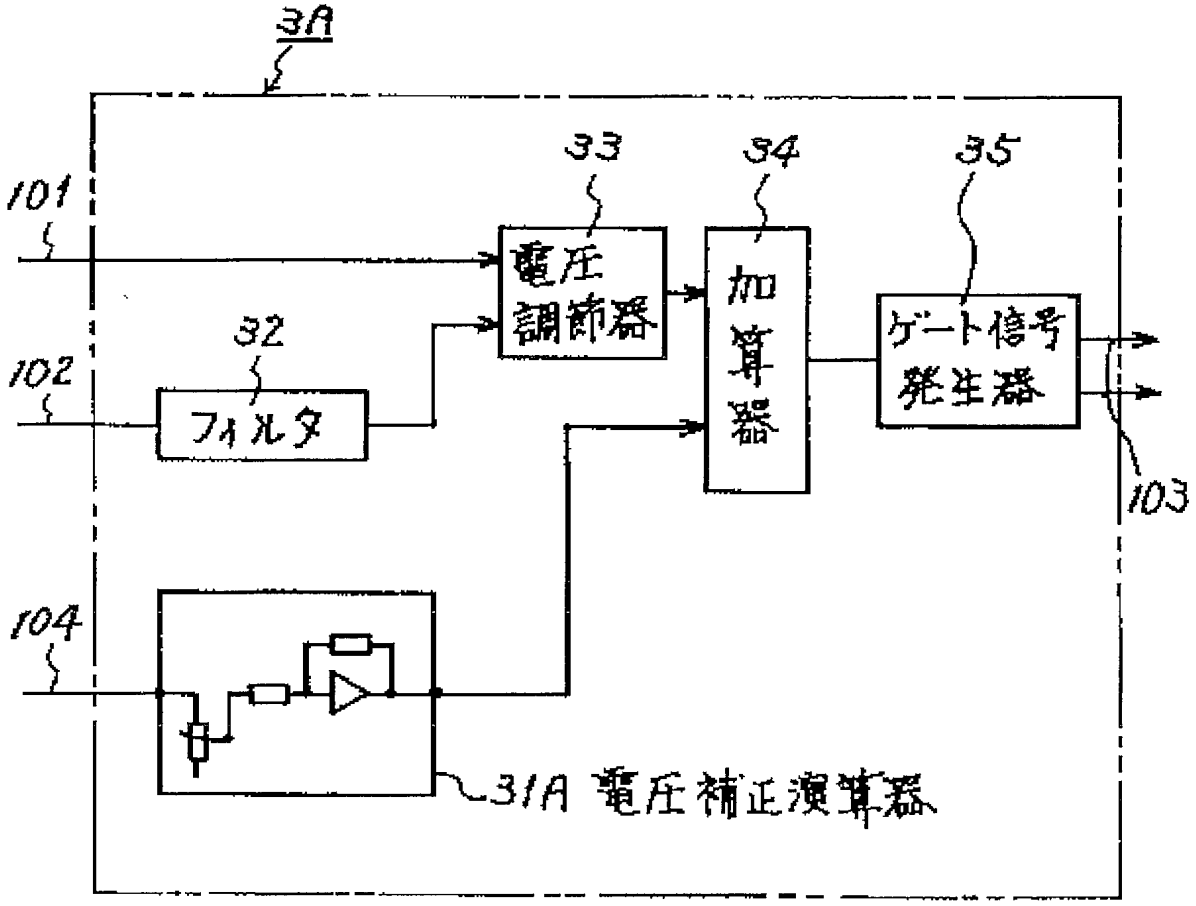
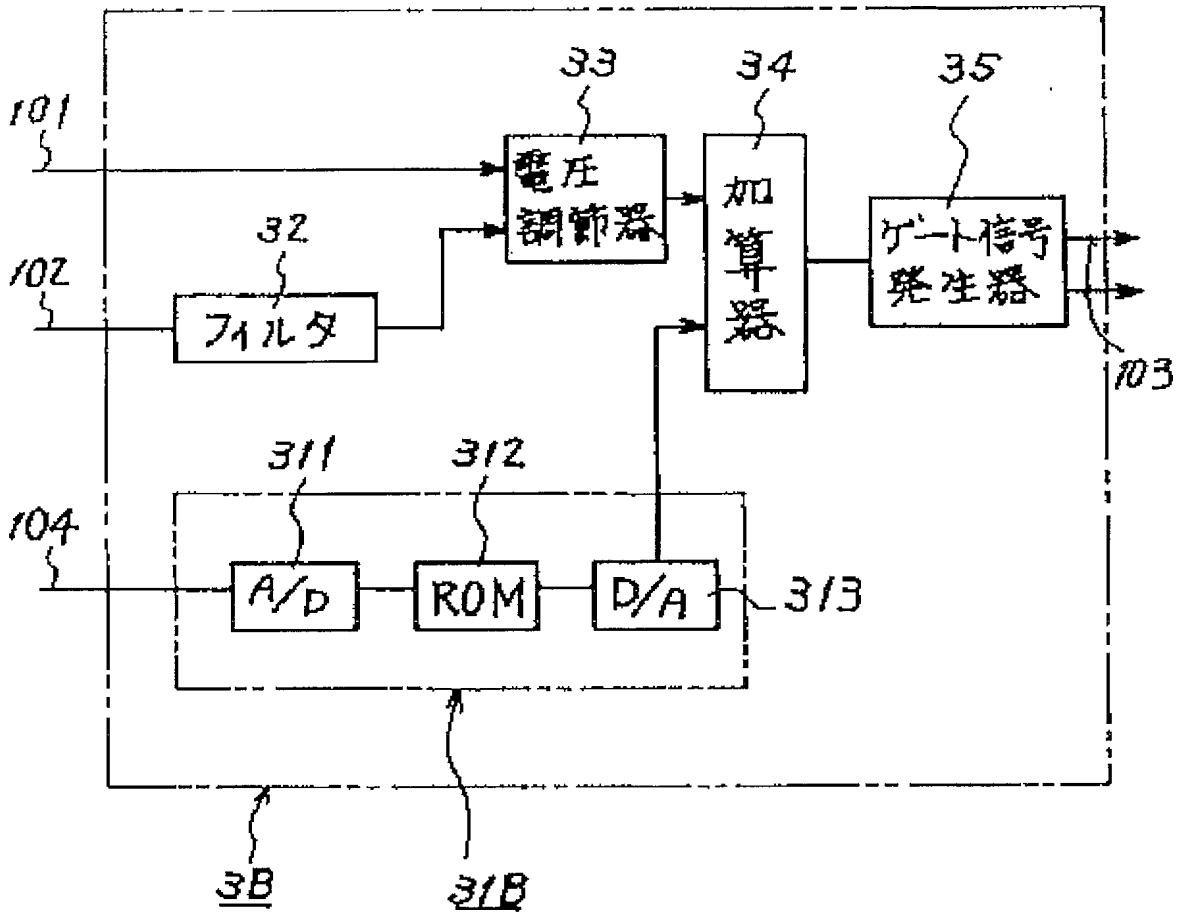
102
71
IA
101
103

[Drawing 2]


3A
101
102
104
32
33
34
35
フィルタ
電圧調節器
加算器
ゲート信号発生器
103
31A 電圧補正演算器

[Drawing 3]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102
104
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34
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32
電圧調節器
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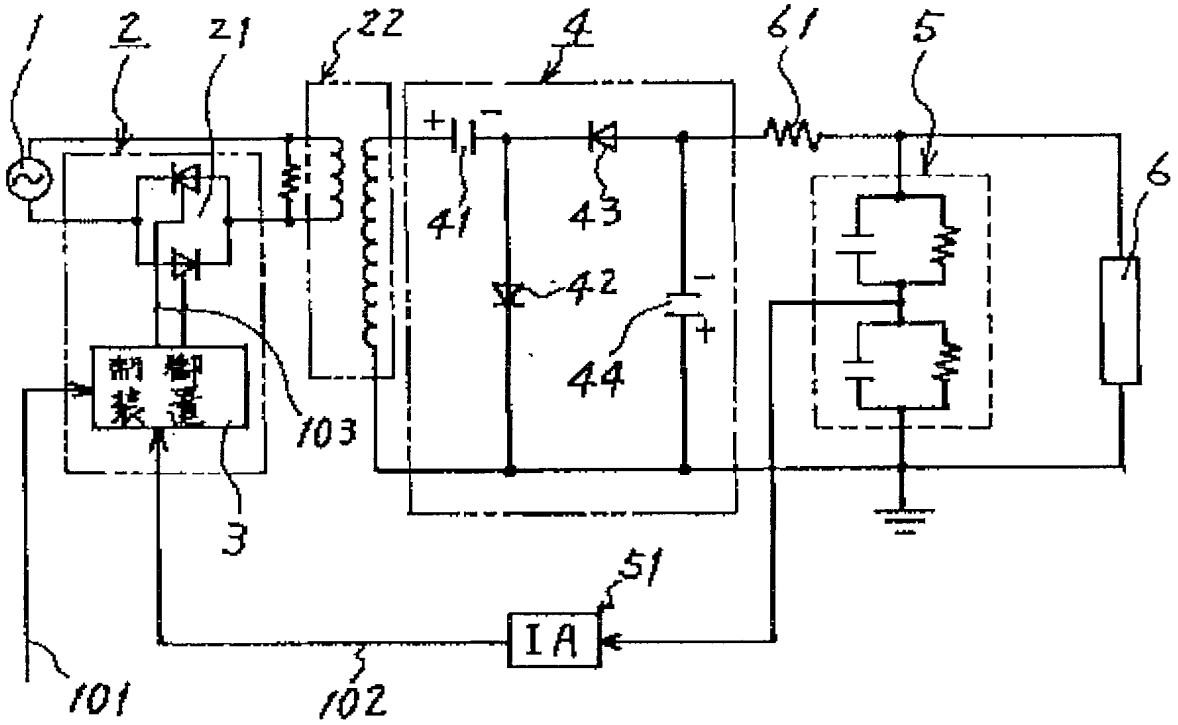
312
A/D
ROM
D/A
313
3B
31B

[Drawing 4]


1
2
21
22
4
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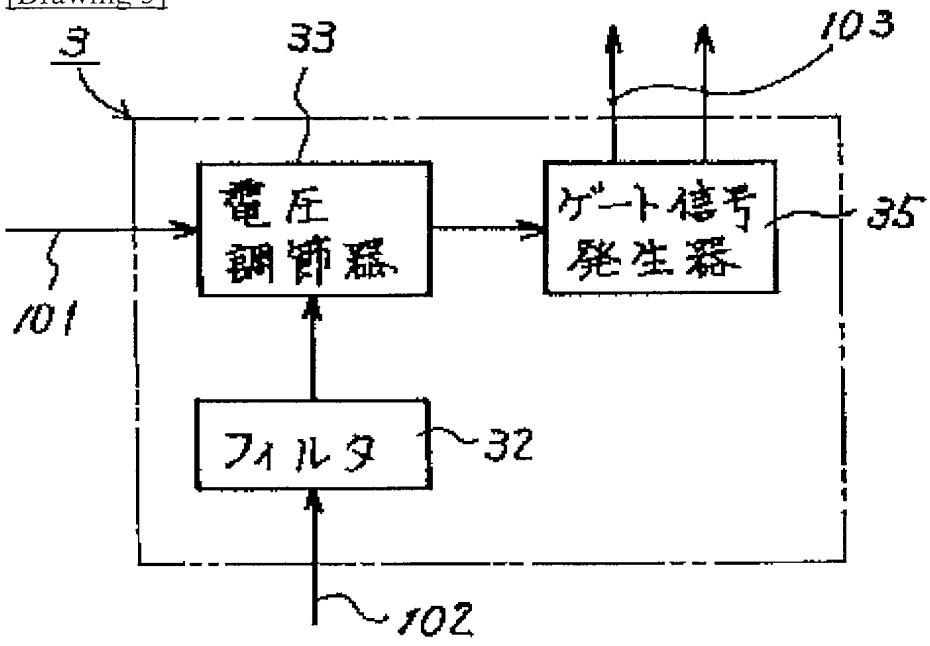
6
41
43
42
44
制御装置
103
3
51
IA
101
102

[Drawing 5]


3
33
103
電圧調節器
ゲート信号発生器
35
101
フィルタ
32
102